When does the cow calve, could a sensor tell us?
Importance of calving

- Dystocia (up to 1/3 of calves, Barrier et al., 2013)
- Calve mortality
- Cow health
Sensor technology

- Many application: oestrus, mastitis, lameness etc.
- Not applied on calving moment
- Sensors for activity and rumination already in use.
- Is an extra application possible?
Main question

- Can sensor data be used to give a more precise prediction of when a cow will start calving?
Data collection

Two farms

583 cows

110 calvings

Camera in calving pen
Moment of calving

Start of calving first image on which cow visibly starts calving
Sensor

Agis Sensoor

Eartag

Measures: rumination, feeding, activity, highly active, not active and temperature
Data preparation

Expected calving dates calculated

Insemination date + 280 days

Independent variable
days to expected calving
Data preparation

Calculated for:
- Ruminating
- Feeding
- Highly active
- Not active
- Temperature

Relative change $$\rightarrow$$ Independent variable
Data preparation

Sensor data selected from:

7 days before the moment of calving up to the moment of calving.
Logit model

Two models

Model 1:
Dependent: Hour in which calving started
Independent: The days to expected calving date

Model 2:
Dependent: Hour in which calving started
Independent: The days to expected calving date,
Relative change in: Ruminating, Feeding,
Highly Active, Not Active and Temperature
Logit model

Result logistic regression

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>AUC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1</td>
<td>22%</td>
<td>90%</td>
<td>0.682</td>
</tr>
<tr>
<td>Model 2</td>
<td>69%</td>
<td>90%</td>
<td>0.878</td>
</tr>
</tbody>
</table>
False positive alerts

![Graph showing the number of false positive alerts over hours before the starting moment of calving.](chart.png)
Discussion

No independent validation

Many missed cases and false positive alerts

More relaxed time window could be an option
Conclusions

Potential to predict moment of calving with studied sensor

Current model needs refinement
Thank you for your attention!